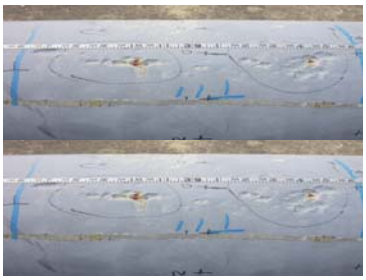
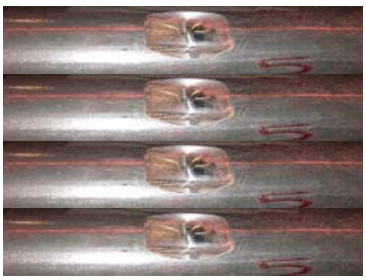
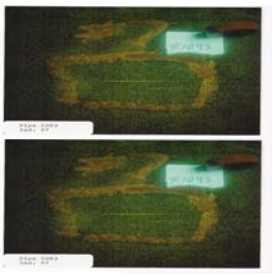
Public Page
Mechanical Damage Inspection Using MFL Technology
Agreement DTRS56-02-T-0002
8th Quarterly Status Report
Period July 1 to September 30, 2004
Contractor: Battelle

The main goal of this project is to design an improved magnetic flux leakage inspection system for mechanical damage. However, one aspect of this project was to prepare a test plan and provide technical support for demonstrating the capabilities of various in-line inspection systems currently being developed under Department of Energy National Energy Technology Laboratory (DOE NETL) and Department of Transportation Research and Special Programs Administration (DOT RSPA) contracts.

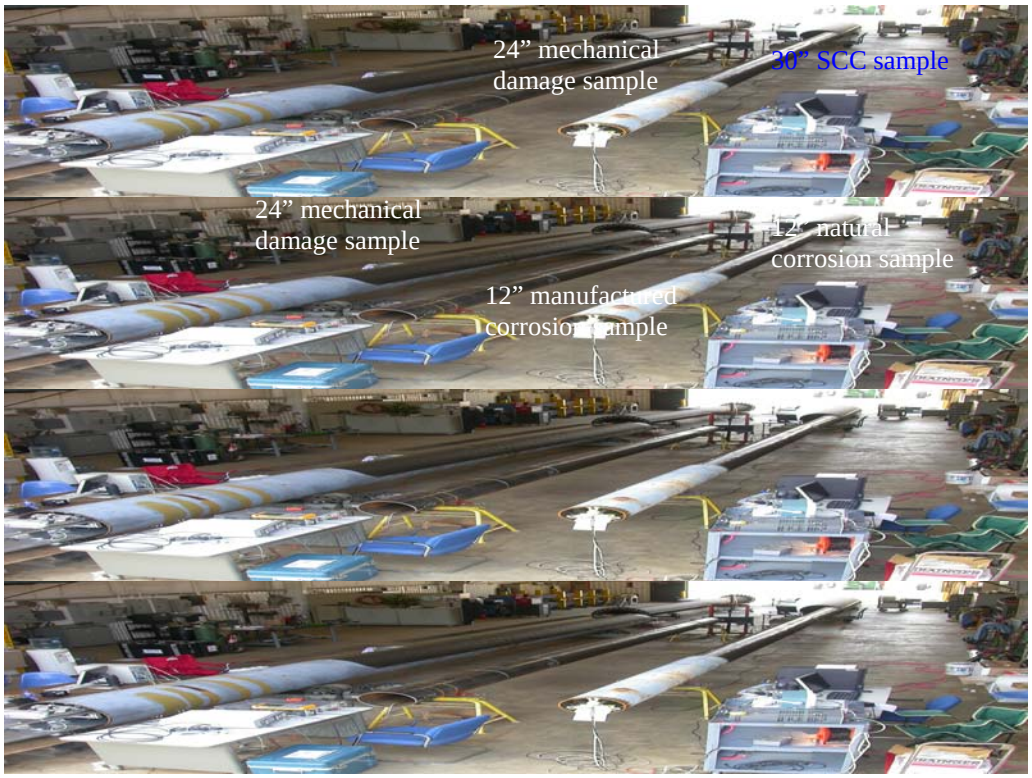
Several sensor technologies are under development to advance the state-of-the-art in natural gas pipeline inspection and to assist pipeline operators with their current inspection problems including unpiggable pipelines, stress corrosion cracking (SCC), bore restrictions, etc. Battelle worked with the DOT RSPA and DOE NETL to devise a testing program that allowed each of the sensor developers to showcase their technologies during a one-week demonstration period in September, 2004. Participants in the demonstration program included:

Company	Technology	Tool Diameter	Defects Examined
Battelle	Moving permanent magnet eddy current	12 inch	Corrosion
Battelle	Dual magnetization MFL	24 inch	Mechanical Damage
Gas Technology Institute (GTI)	Small diameter exciter remote field eddy current	12 inch	Corrosion
Los Alamos National Laboratory (LANL)	Deformation sensor	24 inch	Mechanical Damage
Oak Ridge National Laboratory (ORNL)	Circumferential EMAT	30 inch	SCC
Pacific Northwest National Laboratory (PNNL)	EMAT strain measurement	24 inch	Mechanical Damage
Southwest Research Institute (SwRI)	Collapsible coil remote field eddy current	12 inch	Corrosion
TeleTest	Guided wave	12 inch	Corrosion

Battelle utilized their Pipeline Simulation Facility (PSF) and pipe defect library to develop the demonstration standard and set-up the demonstration program. Battelle's PSF has unique facilities and pipes with representative defects that are ideal for use in the technology demonstration program. The defect sets included natural and artificial defects with a wide range of types and sizes in pipe segments of various wall thickness and diameters. The configuration used to benchmark the emerging technologies consisted of the following pipe samples:

Pipe Sample	Example Defect Photograph
• 12 inch diameter seamless pipe with natural corrosion defects.	
• 12 inch seam-welded pipe sample with manufactured corrosion defects.	
• 24 inch pipe sample with mechanical damage defects.	
• 24 inch pipe sample with plain dent defects.	
• 30 inch pipe sample containing natural stress corrosion cracks (SCC).	

Each pipe configuration had the same defect characteristic philosophy; the detection and sizing of the defects range from simple to difficult to help define both the current capability and future challenges for each of the inspection technologies. The pipe samples were placed within the pipeline testing lab and an electric winch was used to pull each developer's tool through the relevant pipe samples. The exact demonstration layout is shown below:



The results of the demonstration program are currently being evaluated by each developer's Contracting Officer Technical Representatives (COTR). The eventual hope is to pair these sensor technologies with a robotics platform that can maneuver through currently unpiggable pipelines to detect defects similar to the mechanical damage, corrosion, and crack defects evaluated in the demonstration program.

Point of Contact:
J. Bruce Nestleroth
Battelle
505 King Ave.
Columbus, Ohio 43201
nestlero@battelle.org
Voice: 614-424-3181
Fax: 614-458-3181